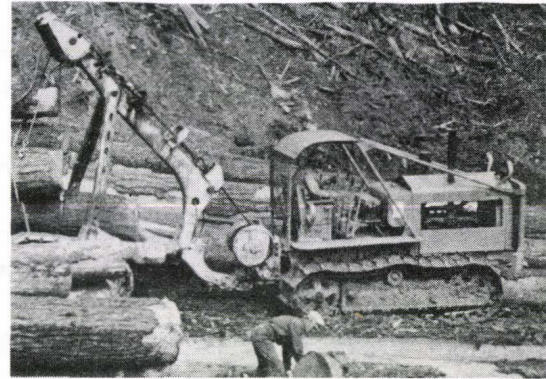
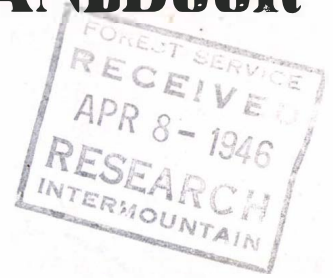


NORTHEASTERN LOGGERS' HANDBOOK

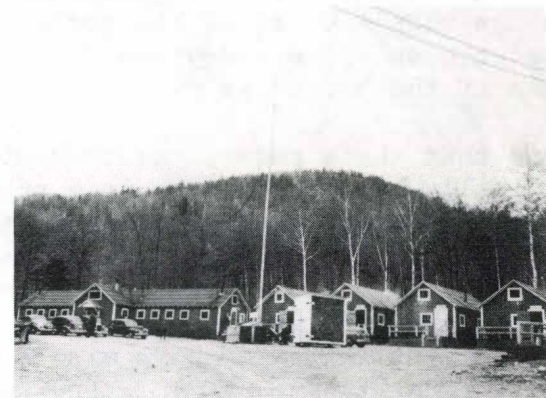
by

Fred C. Simmons

PRELIMINARY REVIEW EDITION



Easier and Safer Work



Greater Production (more pay) and Better Living Conditions

SECTION 2 : — HOW TO CHOOSE, USE AND SHARPEN A CROSSCUT SAW

NORTHEASTERN FOREST
EXPERIMENT STATION



United States Department of Agriculture

FOREST SERVICE
NORTHEASTERN FOREST EXPERIMENT STATION

614 Bankers Securities Building
Philadelphia 7, Pennsylvania

V. L. HARPER, DIRECTOR

FOREST UTILIZATION SERVICE
James C. Rettie, Chief

If you want to be a mechanic, you will easily find plenty of good books which will tell you what you need to know. You will also find plenty of instructors and training shops.

What about the young man who wants to make his living by logging? For him there is no good source of information to which he can turn. The books and courses on logging are for the logging engineers--not for the fellow who uses the axe and crosscut.

Why shouldn't there be a simple illustrated handbook which will tell the young woodsman (or the green woodsman) what he needs to know about the care and use of his tools and the best of the old and the new techniques of, and devices for logging? He needs to know the "tricks of the trade" as much as anyone.

We hope that these pages, together with other short papers like it, will finally be put together in a printed NORTHEASTERN LOGGERS' HANDBOOK. We are putting it out in this form first because there seems to be an urgent need for this sort of information; and because we need the help and advice of persons who know about logging in our region before printing. We want the experienced logger to tell us what important things we have missed and where our advice is not good. We want the young man going into the woods for the first time to tell us what parts of it he finds hard to understand, to suggest how it can be made more useful to him. We would like the equipment manufacturers to check our recommendations for use of their products and tell us about new devices they are developing.

Please send criticisms, questions and suggestions to: The Director, Northeastern Forest Experiment Station, 614 Bankers Securities Building, Philadelphia 7, Penna. Additional copies of this and other publications in this series can be obtained from the same address.

HOW TO CHOOSE A CROSSCUT SAW

Next to the axe, the tool used most by the logger is the crosscut saw. A dozen or more standard patterns, lengths and weights are available. The one to choose for a given job will depend partly upon individual preference and also upon the size of the trees which are to be cut. For the heavier sawlog timber the straight-back model is usually preferred. The blade is stiffer and less likely to be damaged when the saw becomes pinched. For small timber and pulpwood the narrow sway-back model is usually preferred. The narrow blade permits a wedge to be driven in behind the saw even in shallow cuts. The sketches below show the difference in appearance between the straight and sway-back patterns.

SWAY-BACK PATTERN

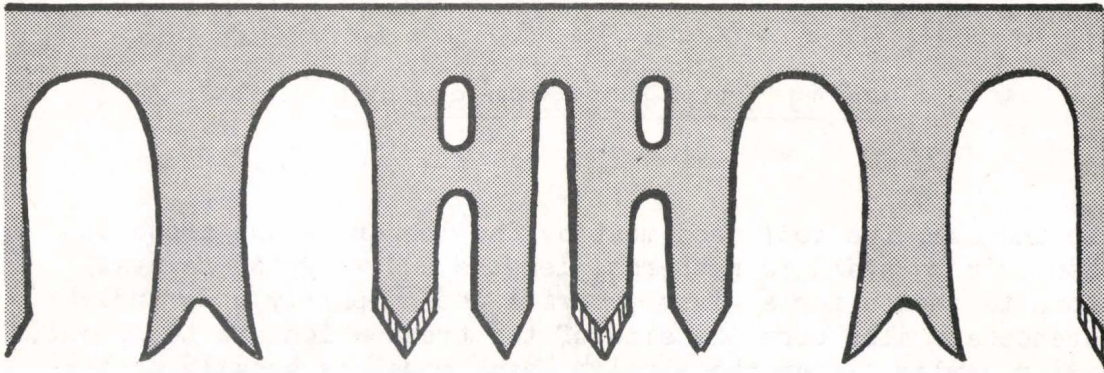


STRAIGHT-BACK PATTERN

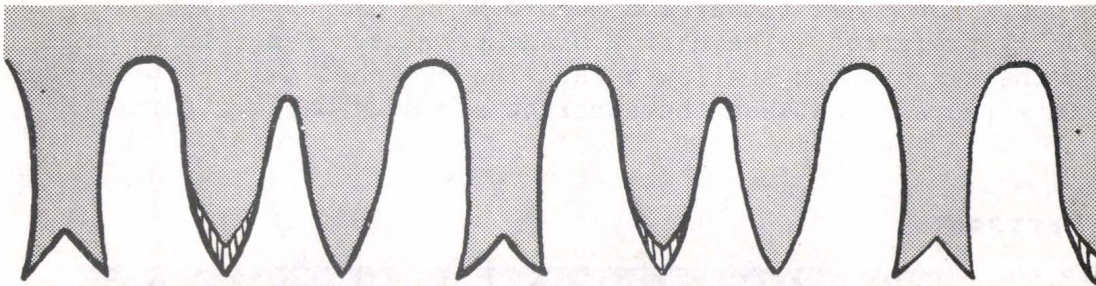


There are also several different tooth patterns. The most common modern tooth arrangement, particularly for softwoods, is four cutting teeth to one raker tooth. Two cutters to one raker is frequently used for hardwoods. A few saws have no raker teeth at all. Several other patterns are made but these need not be discussed here. The three major types of tooth pattern are shown in the following sketch.

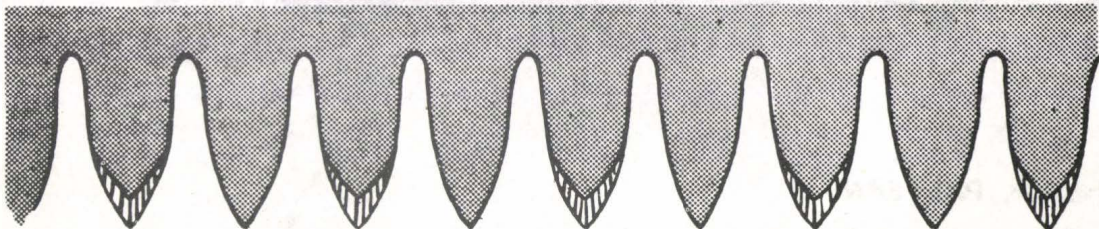
FOUR CUTTERS AND A RAKER



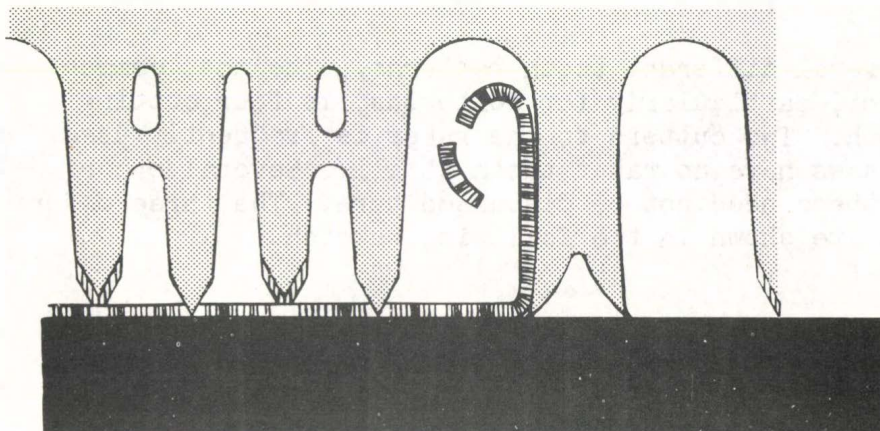
TWO CUTTERS AND A RAKER



ALL CUTTERS - NO RAKERS



The function of the cutter and raker teeth must be understood in order to realize the importance of the following discussion on sharpening the crosscut saw. The sketch below shows the action of the teeth as the saw is drawn through a block of wood.

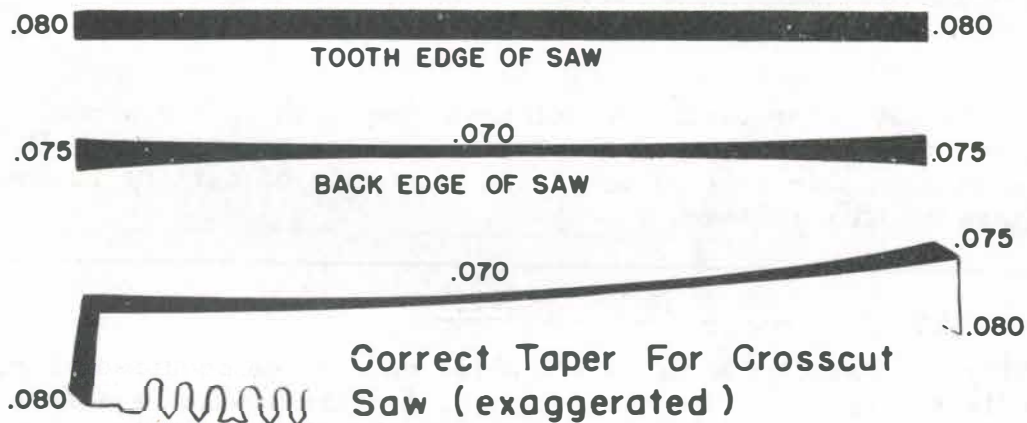


A well sharpened
saw makes
shavings --
not sawdust

Action Of Crosscut Saw

The points of the cutters score the two sides of the kerf (slit made by the saw) cutting the fibers at a right angle. The point of the raker performs a chiseling action and rolls up a thin shaving in the gullet between the raker tooth and the first cutter. When each of these little pockets of shavings is drawn out of the cut it falls to the ground. When the saw is drawn in the other direction, the opposite point of the raker comes into action to perform in the same way. It is thus easy to see that a crosscut saw needs to be long enough to permit at least half of the saw to protrude from the sides of the block that is being cut. Otherwise the saw will not properly free itself of the accumulated shavings at the end of each stroke. The sawyer must also remember that long strokes are far more effective than short ones.

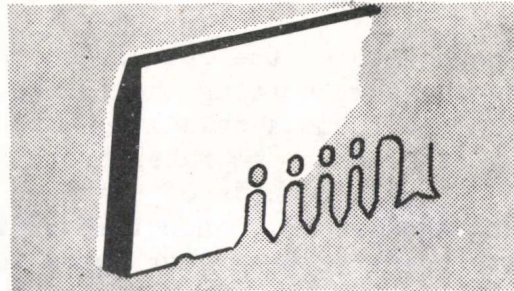
In order to give a freer movement of the saw through the kerf, the modern manufacturer usually grinds the blade with a slight taper from the cutting edge to the back. The backs of some saws are also tapered from each end toward the middle. The amount of taper is, however, so slight that it can not be seen without a measuring instrument. The drawing below exaggerates the cutting-edge-to-back taper and the ends-to-center taper merely to show where they are.



The object of these methods of grinding is to give a freer running saw and lessen the tendency of the saw to bind or pinch.

Beware of the imitation taper-ground saw in which all of the taper is in the last half inch or so of the back edge.

Development of better and more uniformly tempered steels has made it possible for manufacturers to increase the size of gullet space and make cutting teeth more sharp and slender. This gives a fast cutting saw. It has also been possible to grind a raker which will keep a chisel-type point for a long time and thus eliminate the need for "swaging" the rakers.



Saw With Simulated Taper

The sketch below shows a swage-ground raker in comparison with the older type which had to be swaged by pounding with a hammer.



Saws without raker teeth are not used very much in the woods. They are used on farms where much of the sawing is done on dry wood. It is easier to sharpen this type of saw. The slow rate of cutting is the chief disadvantage of this pattern.

HOW TO FIT A CROSSCUT

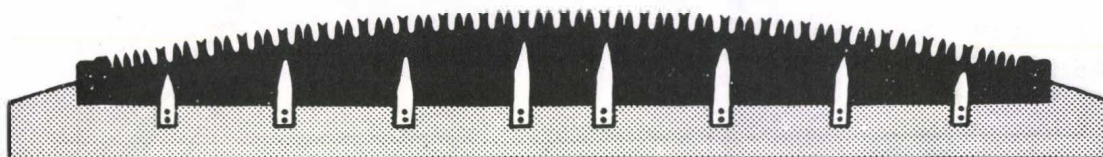
Fitting a crosscut saw is an art which can not be acquired without considerable experience. The elementary instructions which are here offered can do more than set the beginner on the right track.

The tools necessary to do this job are: saw clamp, flat file, combination jointer and raker gauge, spider, or set gauge, setting anvil and setting hammer.

Saw Clamps

Most saw clamps are home-made devices of very simple design. The important features are that the saw will be held firmly and that it shall be perfectly straight with the teeth pointing upward. It is

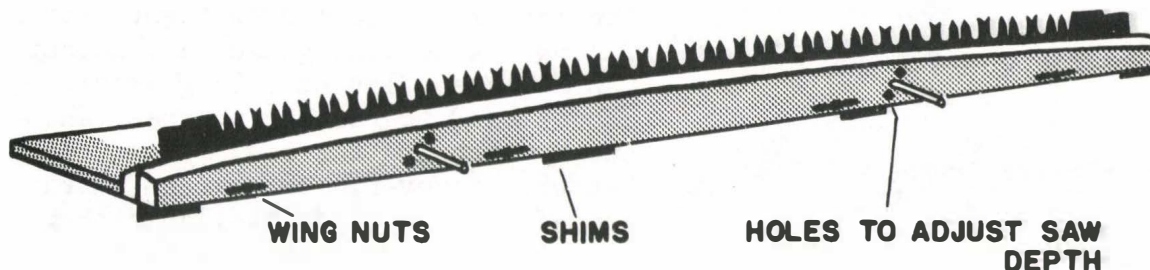
very desirable to have the clamp hinged to its supporting base in such a way that the saw can be tilted away from the filer at an angle of about 30 degrees. This makes it possible to file the cutter teeth without bending over and to watch the filing operation more easily. The result is more uniformity in the bevel which is given to the teeth. One good clamp is made of two planks 3 inches thick by 10 inches wide. The length depends upon the length of the saw to be filed. The clamp should be two or three inches longer than the saw at both ends. One plank is laid down flat to serve as the base. The second plank is carefully planed on one side until it is perfectly flat and true. The next step is to dress one edge of this plank with a draw knife until it fits the contour of the saw teeth as shown here.



Simple Saw Holding Device For Sharpening

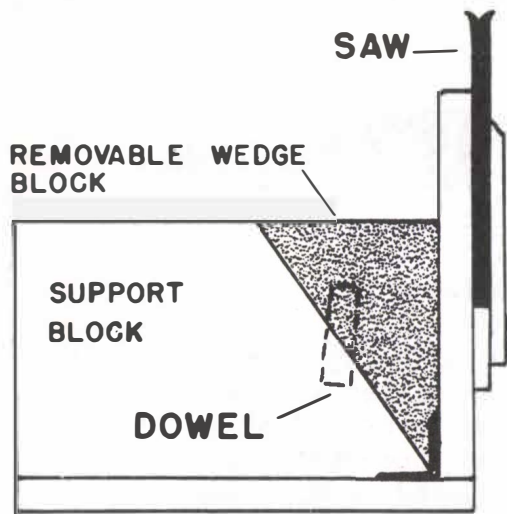
The saw can be held in place by a number of hardwood strips about $\frac{3}{8}$ inch thick and 1 inch wide. Strips can be nailed to the plank. A piece of fiberboard should be placed under the lower end of each strip just thick enough to make the saw, held between the strips and the plank, fit tightly. These strips should be spaced under every second or third raker so that they will not interfere with the setting and gauging of the cutter teeth.

Another method of holding the saw firm while filing and setting requires a third plank to be used in place of the strips. This plank is also shaped to the contour of the teeth. Edges clamping the teeth should be beveled at a 30° angle to avoid interference during filing. This method supports the saw more rigidly on both sides. Bolts with wing nuts are desirable to hold the front plank in place. Thin wood or cardboard shims may be inserted between the bottom portion of the two planks to tighten the top edges clamping the saw. Holes for pegs may be provided in the planks to alter the depth of the saw in the clamp as needed for various operations in filing and for variable widths of saw blades.

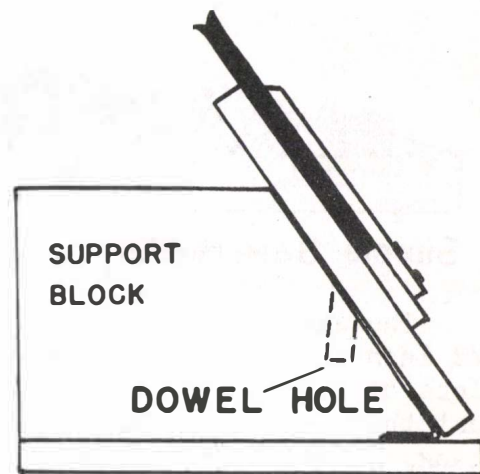


Saw Holding Device #2

The planks thus shaped to hold the saw are then attached to the base by means of two heavy strap hinges. While working on the raker teeth and while setting the cutters, it is best to have the saw teeth pointing straight upward. This can be done by putting a support block alongside each of the hinges. The inside plane of these blocks is sloped away from the elbow of the hinge so that the saw clamp board will be at a 30° slope when it is pushed over against it. When the saw must be in the vertical position, a removable wedge block is slipped in between the support block and the saw clamp board. The following sketches will illustrate:

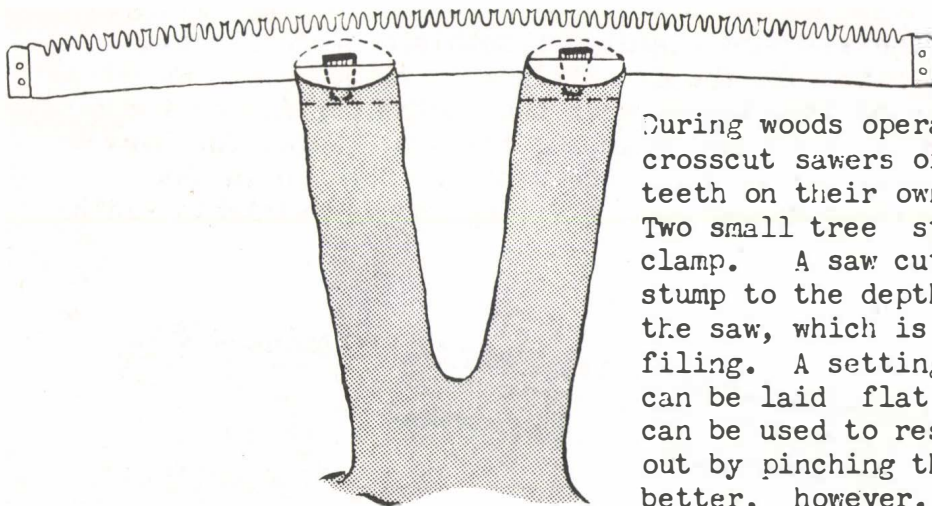


POSITION FOR FILING RAKERS
AND FOR SETTING



POSITION FOR FILING CUTTERS

End Views Of Saw Holding Device

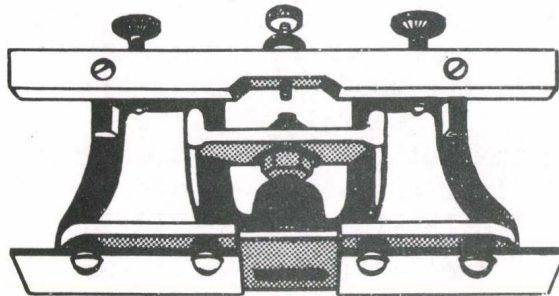


Emergency Saw Holding
Device

During woods operations experienced crosscut sawers often touch up the teeth on their own saws in the woods. Two small tree stumps serve as the clamp. A saw cut is made in each stump to the depth necessary to hold the saw, which is wedged tight, for filing. A setting gauge anvil that can be laid flat on a large stump can be used to restore the set taken out by pinching the saw. It is far better, however, to have an extra camp-filed saw blade available than to attempt to do such a haywire job in the woods.

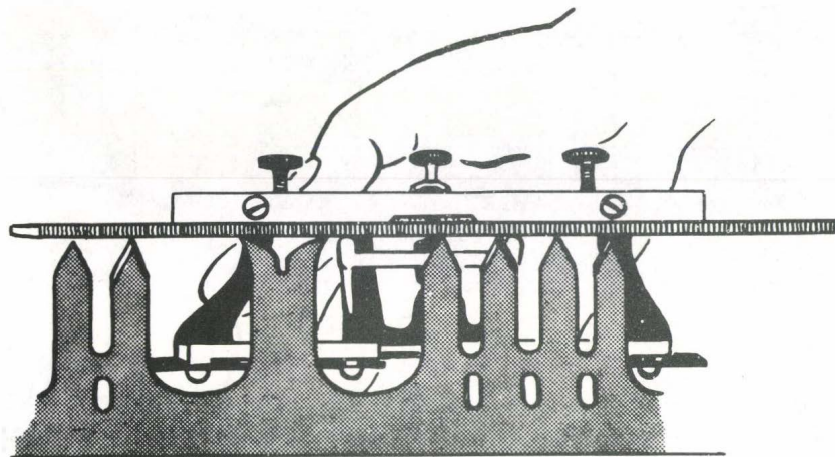
Jointing the Saw

The first operation in fitting a crosscut is to bring all the cutting teeth to a uniform length. This is done by the use of the combination jointer and raker gauge. A commonly used model is illustrated here.



One Type Of Jointer Tool

The jointing operation is done by inserting an unhandled eight-inch mill file, preferably one that is worn rather smooth, under the top bar, and turning the adjusting screws at each end until the file is firmly gripped. Then, carefully tighten each screw further until a slight bend in the file is noticeable. This makes the file conform to the curve of the saw teeth. After the file is properly set in the tool, place it on the saw as shown below—file resting on the teeth and the lower edge of the jointer resting against the blade.



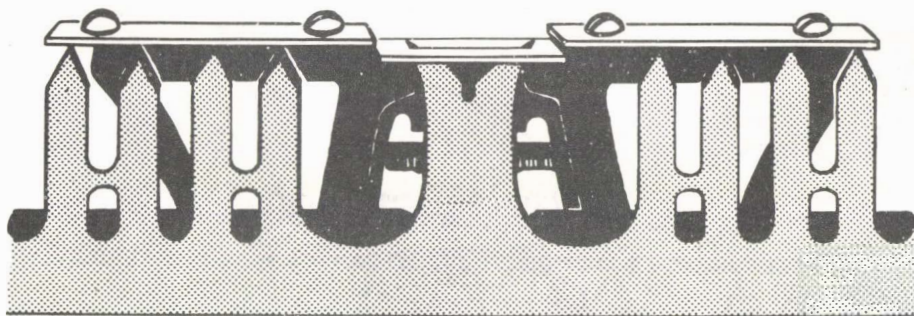
Jointing Cutting Teeth

Draw the jointer across the entire length of the blade with a very gentle pressure to avoid excessive cutting. Be sure that the file surface remains level and that the cutting teeth are out down no more than is necessary to make all of them touch the file as it passes over them. Snag or broken teeth should be ignored. The tooth jointing operation is then finished.

Jointing the Rakers

The next step is to bring all the raker teeth to a proper height. The points of the rakers should be slightly shorter than those of the cutters. This prevents the rakers from chiseling into the kerf too deeply and tearing up wood that has not yet been released by the cutters. Long rakers cause the saw to jump, besides causing it to pull harder and cut slower. Rakers that are too short, on the other hand, do not chisel deeply enough to permit the cutters to do their full work. The condition of the wood also has a bearing upon the length of raker to be used. In general, the rakers should be $1/100$ to $1/64$ inch shorter than the cutters for use in hardwoods and frozen softwoods and $1/64$ to $1/32$ inch shorter when used in unfrozen softwoods. Experience will teach the filer how to fit his rakers for local species and cutting conditions.

To gauge the rakers, remove the file and turn the jointer tool over with the opposite side up. In the middle of this side there is a slot in a short step-down section which will slip onto the raker leaving the points protruding. The amount of protrusion is adjusted by means of the screw and lock nut adjustment in the center of the tool. A feeler gauge when inserted between the raker-filing surface and gauge resting on a flat steel surface is a useful check on raker gauge adjustment. This adjustment is made to give the proper reduction in the length of the rakers. The points are filed down flush with the step-down section of the tool. The position of the tool just before the filing operation is shown below.



Use Of Jointer Tool On Rakers

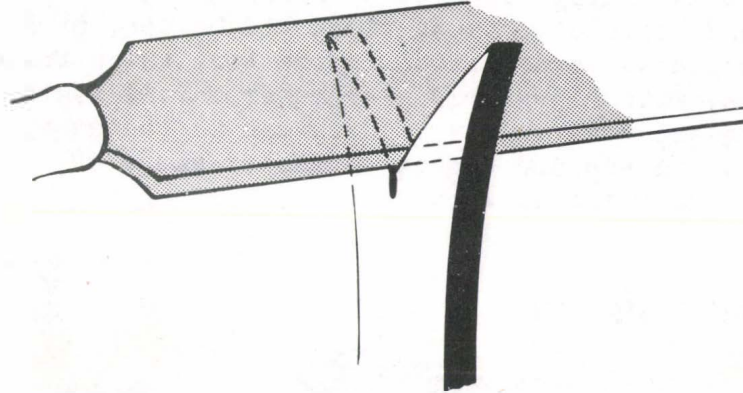
If the rakers are to be swaged and the saw is to be used for hardwoods, they frequently can be left the same height as the cutting teeth at this stage, depending on the swaging to reduce them to the correct height below the cutters. If the swaged saw is to be used for softwoods the rakers should be jointed about $1/64$ inch.

Filing the Rakers

The next step is to file the raker teeth. This is done by filing straight across each face of the raker "V" until each tip comes to a

sharp point. A flat or triangular single-cut file can be used. Be very careful to keep the file horizontal, and not to reduce the raker points below the height indicated by the jointing. After filing, each side of the "V" in the rakers should have an angle of approximately 45° from the vertical. Do not touch the gullet side of the rakers with the file. This operation is illustrated in the following sketch.

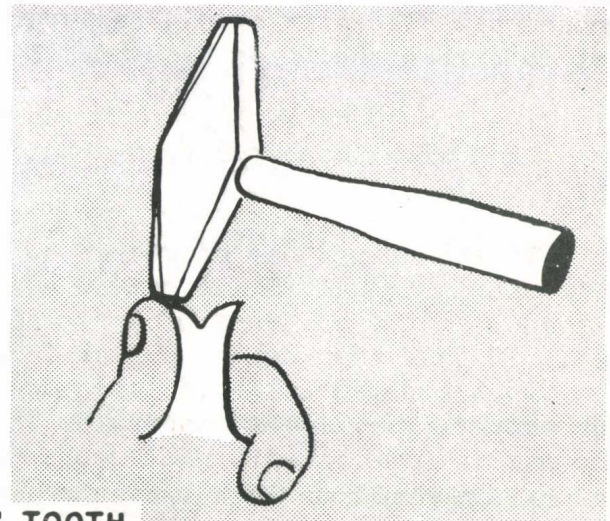
SHARPENING A RAKER TOOTH



The height of the rakers after filing can be tested with the special screw provided for that purpose on most jointer-gauges. This is directly opposite the step-down section on the gauge illustrated. Adjust this screw, using the calibrations provided, or better yet a thickness gauge, to give the proper raker tooth height and place the tool on the cutting edge of the saw. The protruding end of the screw should then just clear the tips of the filed-down rakers. This provides a check on the raker filing operation.

SWAGING THE RAKERS

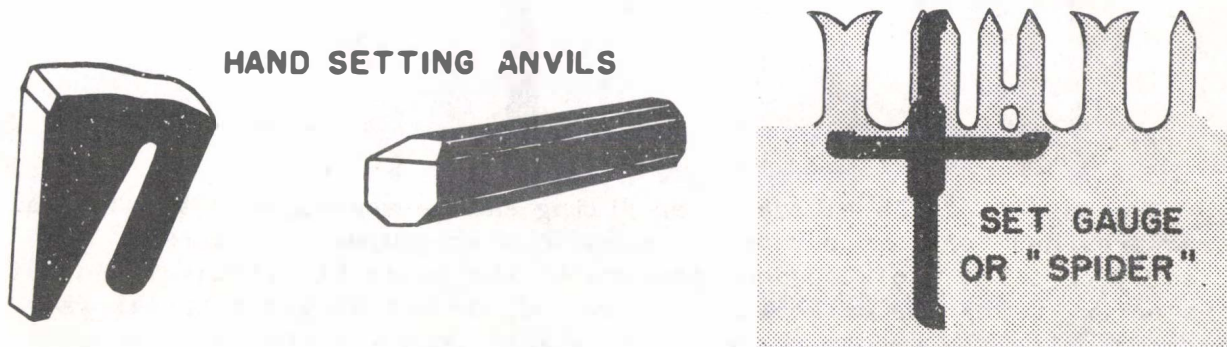
If a saw with straight raker teeth is being filed, and swaged rakers are desired, the rakers are now ready to be swaged. Most modern saws have rakers that are swage ground, and hand swaging is fast becoming a forgotten art. It is done by giving the tips of each raker a light tap or two with the setting hammer. These slight strokes will bend the tip of the raker down a trifle. By resting the finger on the edge of the tooth you can feel the "hook" being made. After swaging, the height of the rakers should again be tested with the jointer-gauge, and the tips filed lightly to insure that they are straight across.



SWAGING RAKER TOOTH

SETTING THE CUTTER TEETH

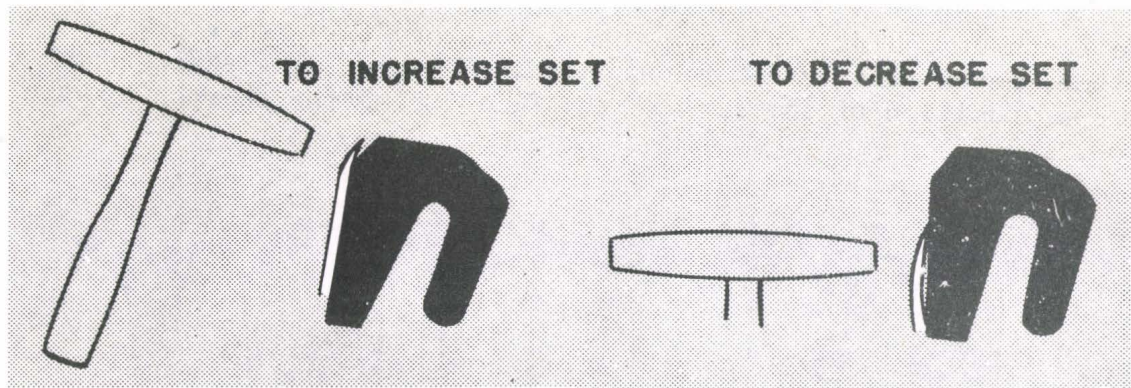
The setting of the cutter teeth is the next operation. Set is important in the saw to prevent binding, permitting the saw to be pulled more easily and to cut faster. Setting requires the use of three special tools: the setting hammer, illustrated in the sketch above; a setting anvil, two models of which are illustrated below; and a set gauge of "Spider", also illustrated below. This type of spider will have to be carefully prepared to check the set on each type of saw to be filed, and for each type of timber to be cut, by filing off one or more of the prongs as described in the text which follows. More elaborate spiders, with adjustable micrometer screws taking the place of the lower prong are available. Spiders can be tested by holding them on a flat steel surface and running a feeler gauge of the correct thickness under the upper prong.



The hand anvil is held against the back of the tooth, with the beveled edge about one-quarter to three-eighths inch below the tip. It is important that each tooth extend exactly the same distance over the bevel. Then, by striking the face of the tooth lightly just opposite the bevel in the anvil the proper amount of set is given to its tip. This, for a modern taper ground saw, should be about .016 inch for softwoods, and about .008 inch for hardwoods. For flat-ground saw blades it should be about twice as much. Be very careful not to strike the filed faces of the tooth with the hammer.

The amount of set given is tested by placing the "spider" against the blade with the upper prong resting against the tip of the back of the tooth.

If the spider can be rocked up and down, the tooth has not enough set. Apply the anvil and hammer again until the required set is obtained. If the spider can be rocked sideways, the tooth has too much set. In this case hold the flat face of the anvil against the back of the tooth and tap a little lower down until the set is reduced the proper amount. It is very important that the set of each tooth be exactly the same. Otherwise it will score the sides of the kerf and make the saw hard to pull through the cut.

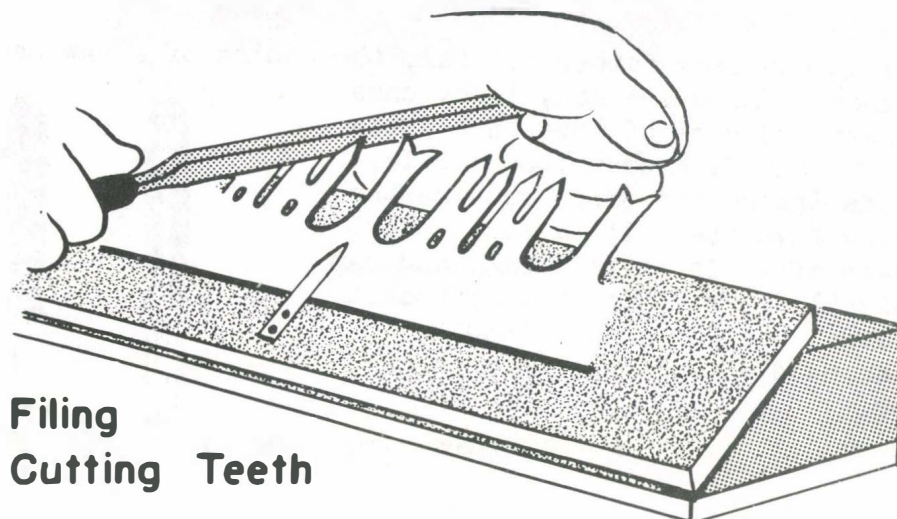


Several pliers-type set tools are on the market. None of these are recommended for crosscut saws because they place the set too far down on the tooth. The flat anvils for use on a stump are not recommended except for emergency jobs when a tooth is sprung in the woods.

FILING THE TEETH

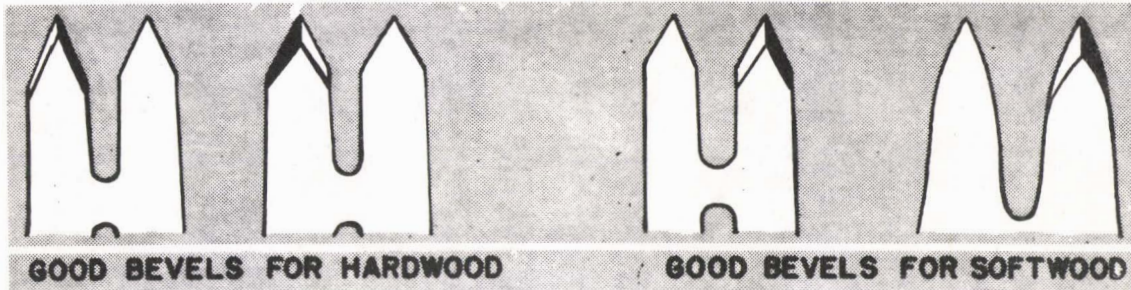
The final operation is filing the cutter teeth. Tilt the saw clamp to its 30° angle. Use a good sharp file fitted with a comfortable handle. Use long strokes and raise the file from the tooth at the end of each cutting stroke. Tap the file on the bench frequently to loosen particles of metal that may be sticking to the cutting surface. It is also possible to prolong the useful life of the file by cleaning it occasionally with a steel bristle brush.

The filing job requires skill, but also much care and patience. The teeth must be filed on a correct bevel and exactly to a sharp point. Excessive filing on the point shortens the tooth and thereby spoils all the work that was done in jointing the cutters. It also spoils the relationship with the rakers. Great care should be taken to see that the filing stops when the smallest reflection is obtained from the flat point made by the jointing operation. Burrs formed on the opposite side



Filing
Cutting Teeth

of the tooth by the filing operation may be carefully removed with a whetstone, but a file is not recommended. The preceding sketch shows the proper position of the saw and the file during the sharpening operation.

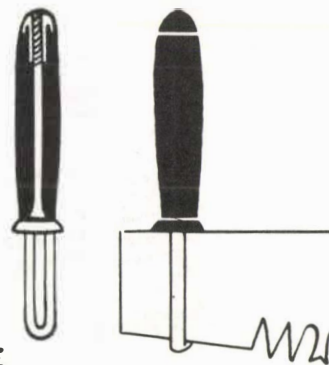


Hardwoods need more metal in the points of the teeth than softwoods. In one case above this is obtained by filing the bevel stunt; in the other by a wide angle on the tooth point. When the timber to be sawed is frozen or knotty, it is well to make the bevel even more stubby, thus leaving more metal in the point of the tooth. This makes the saw cut slower but it holds its cutting edge better. Flat bevels are easier to file than rounded ones. Never file the back edges of the cutting teeth. This will cause them to bind in the kerf.

The series of steps described above are all necessary in the fitting of a crosscut. There is, of course, for the inexperienced person always the temptation to leave out one or two and to do some of them hastily. The price which must be paid for these shortcuts is hard, back-breaking work and much less production. In almost all woods operations where the crosscut is used, it will pay to have one man assigned to the job of fitting the saws and to give him plenty of time to do the job well.

HANDLES

While it may seem rather trivial, the choice of a saw handle is of importance. There are many fancy ones on the market and some of these are satisfactory. The old-fashioned loop handle, with threads inside the grip, remains the overwhelming favorite. It is easily put on and taken off. It holds firmly and can be conveniently carried in the hip pocket. The best model has the loop extending through the handle to engage an iron cap on the top.

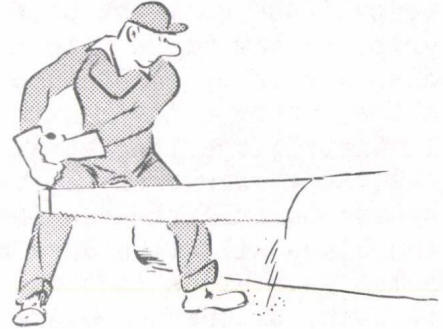


LOOP TYPE HANDLE

USE OF THE CROSSCUT

In starting the cut, a few sharp and short strokes are necessary. Be sure to keep the hands away from the sides of the saw, and, above all, do not put a hand on the log near the cut at this time. The blade is quite likely to jump out of the intended cut and inflict a very bad injury.

After the cut is started, saw with long easy strokes. The saw has teeth throughout its entire length and it does its best work when all of them are used. When two men are sawing, do not push the saw into the log. This causes buckling and a crooked cut which makes the saw much harder to pull.



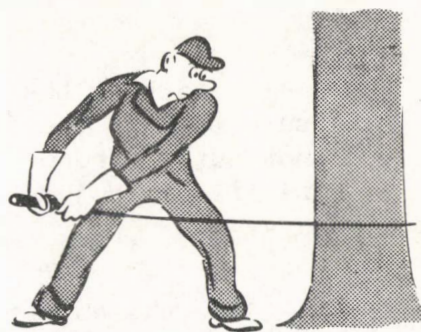
Position For Bucking

If the saw begins to pinch, stop and insert a wedge in the cut behind it. In bucking small-sized trees it is usually better to raise the log and block it from underneath. When sawing pitchy woods such as pine and spruce, sprinkle the saw blade from time to time with kerosene. A pint bottle with a slotted cork or a wisp of pine needles or coarse grass stems stuck into the neck for spraying is quite satisfactory.



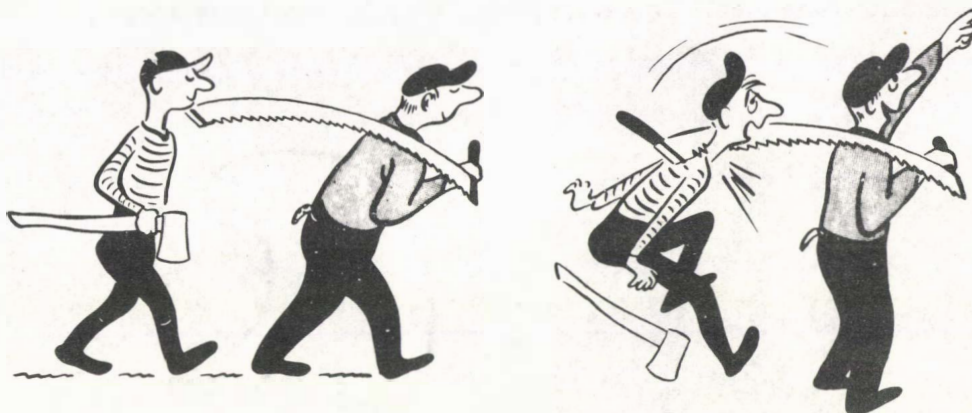
Position For Felling

Use of the saw in felling is much the same as in bucking. The cut is started with a few short strokes. It is important that the saw blade be kept horizontal with no sag in the middle at this time, and until it is well started into the tree. If there is such a sag, it will cause a "U" shaped cut through which it will be much harder to pull the saw. The best way to prevent it is to grip the saw blade with one hand, alongside the handle, and to be careful to pull straight away from the cut on a level with it. When the cut is well started, the long steady fast-cutting strokes of the expert saw crew can be started. It is not necessary to pull the saw into the cut. The belly in the blade will take care of that. Just pull the saw straight out, and then let your hands ride the handle back as your partner pulls it his way. Don't push, or the saw blade will buckle. And don't expect your partner to pull your arms back as well as the saw. If you do, he is likely to tell you, "I don't mind your riding the saw, but don't drag your feet."

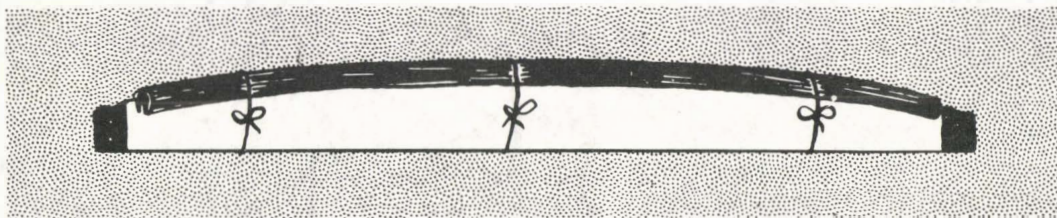


**POSITION FOR
STARTING CUT**

In carrying the saw, it is best to remove one of the handles and put the blade across the shoulder with the teeth away from the neck. When turning with the saw in this position, be very sure that no one is standing near you. Saw tooth punctures make very bad wounds.



For long distance carrying, a short length of garden hose slotted through its length and tied over the saw teeth will protect the edge of the saw and the user.



Rubber Hose Guard For Saw Teeth

In an emergency an old piece of burlap sacking can be wrapped around the saw.

Never let an unguarded saw rattle around in the bottom of a truck where it can be stepped on. There is no quicker way to ruin the filing job. It is cheaper and easier in the long run to make a carrying rack or tool box.

SOME MANUFACTURERS OF CROSSCUT SAWS USED IN THE NORTHEAST

	<u>First Grade Brand Names</u>
E. C. Atkins & Co. Indianapolis, Ind.	"Silver Steel" "Blue End"
Curtis Saw Co. St. Louis 20, Mo.	"Curtis Fast Cutter"
Henry Disston & Sons Philadelphia 35, Pa.	"Disston" "Precision Ground"
Simonds Saw & Steel Co. Fitchburg, Mass.	"Simonds" "Crescent Ground"
Ohlen-Bishop Manufacturing Co. Columbus, Ohio	"Greyhound" "Ohlen Bishop"
E. F. Decker Saw Works 61 Westerly Street Albany, N. Y.	
Great Neck Saw Mfrs. 2nd Street Mineola, L. I.	

Sections in this series previously issued:

Section 1: How to Choose, Use and Sharpen Your Axe